(12) UK Patent Application (19) GB (11) 2 252 059 (13) A

(43) Date of A publication 29.07.1992

(21) Application No 9127163.5

(22) Date of filing 20.12.1991

(30) Priority data
(31) 9100643 (32) 11.01.1991 (33) GB

(71) Applicant
Michael John Shaffery
The Outlook, Cleobury Road, Bewdley, Worcs, DY12 2QJ, United Kingdom

(72) Inventor
Michael John Shaffery

(74) Agent and/or Address for Service
G F Redfern & Co
The Nash, Neen Savage, Cleobury Mortimer, Kidderminster, Worcs, DY14 8LQ, United Kingdom

(51) INT CL[5]
B01D 46/34

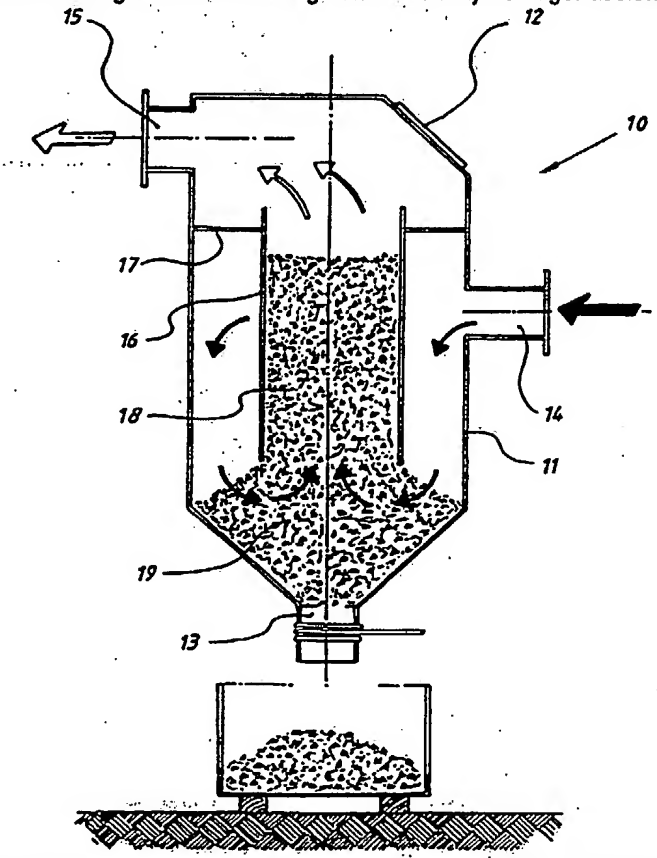
(52) UK CL (Edition K)
B1T TFCA
U1S S1438

(56) Documents cited
GB 2191715 A GB 2119675 A GB 0979560 A
US 4622052 A US 4452613 A

(58) Field of search
UK CL (Edition K) B1T TFAA TFBA TFBB TFBX TFCA TFDA TFDX TFEA TFXA
Online database: WPI

(54) Filter system

(57) Contaminated gas, such as flue gas, or air is filtered as it flows from inlet 14 to outlet 15 through one or more beds 18, 19 of ceramic beads or crushed refractory bricks in a housing 11. If gaseous contaminants are to be removed from the gas, as well as solid particles, then suitable chemicals may be added to the bed. The bed material may be discharged at 13 and more material fed in at 12, when blinding occurs. Discharge and feed may be auger assisted.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 252 059 A

experienced in achieving high efficiency levels.

As employed herein, the term "gas" is intended to include, for example, furnace emissions, and also what is commonly and colloquially referred to as air, in spite of the fact that dry atmospheric air contains eight gases of which seven are elements and the remaining one (carbon dioxide) is regarded as a stable compound.

Accordingly, in a first aspect, the present invention consists in a method of cleaning a gas (as defined above) which has been contaminated, said method including the step of passing a stream of the contaminated gas through a bed of heat-resistant, free-flowing granular material in order to cause a substantial proportion of the or each particulate contaminant to become trapped in said granular material.

In one embodiment of the method described in the preceding paragraph, the stream of contaminated gas may be passed through a bed of refractory material. Said refractory material could be a recycled waste material (e.g. waste refractory bricks which have been crushed and graded) or a specially made product like small ceramic beads. The method according to this embodiment is considered to be necessary for the cleaning of any contaminated gas (as defined above)

whose temperature is greater than of the order of 200°C, this being the approximate limit for dry filters unless they are made of ceramic material.

In a method of cleaning as described in either of the two preceding paragraphs, the gradual blinding of the bed by the contaminant(s) is a desirable result which (obviously not beyond a certain point) actually ameliorates the efficiency of the cleaning; this is due to the progressive reduction in size of the interstices of the material constituting the filtering bed.

The refractory material may be crushed refractory bricks as already stated but refractories (used for example in the lining of furnaces) may be made from chine clay or ball clay or fireclay, all of which fuse at above 1700°C. Other materials are silica, magnesite, dolomite, alumina and chromite.

In a method as described in any one of the four preceding paragraphs, removal of contaminants which are of gaseous form (e.g. sulphur dioxide) is achieved by the addition of the necessary chemical(s) and/or chemical compound(s) to the granular material before said material is formed into said bed.

In a second aspect, the present invention consists in an apparatus operable to enable the carrying into effect of the method described in any of

the fifth, and fourth and third preceding paragraphs, said apparatus comprising a vessel which has a first aperture for the loading of heat-resistant, free-flowing, granular material into the vessel, a second aperture for the discharge of such granular material containing particulate contaminant, a third aperture for the admission into the vessel of a gas (as defined above) which has been contaminated, a fourth aperture through which cleaned gas may pass out of said vessel, and baffle means within the vessel and such as will ensure that said contaminated gas will pass from the third aperture to the fourth aperture through said granular material.

In one embodiment of an apparatus as described in the preceding paragraph, the discharge of the granular material which contains particulate material may take place under the influence of gravity.

In an apparatus as described in either of the two preceding paragraphs, the baffle means include a vertically arranged tube which, with parts of the outer wall of the vessel, serve to support a column of the granular material through which the contaminated gas will pass; one form of said apparatus is illustrated by way of example only in the accompanying drawing.

The Present invention will now be more particularly described with reference to said accompanying drawing which diagrammatically illustrates an apparatus 10 which comprises a vessel 11 which is right-circular and which has (a) a first aperture 12, (b) a second aperture 13, (c) a third aperture 14, (d) a fourth aperture 15, and (e) baffle means 16,17. The right-cylindrical member 16 is connected to the vessel 11 by the annular element 17 and serves to support a column 18 of the granular material which is the filtering medium and which is fed into the vessel 11 via the aperture 12. At the bottom end of the member 16, the granular material obviously spreads into a double-conical mass 19.

The contaminated gas to be cleaned is fed into the vessel 11 via the aperture 14, passes through at least a portion of the mass 19 and upwardly through the column 18 towards the aperture 15 out through which the cleaned gas passes.

When it is thought that the filtering medium is becoming too dirty or blinded, the aperture 13 can be opened in any desired manner to allow some of the blinded medium to be discharged. However, the gradual dirtying of the granular material with the contaminant(s) will, it is believed, gradually improve the quality of the filtering until, obviously, the filtering

medium has become blinded.

The vessel 11 could have auger-assisted discharge of the dirty granular material. Also, there could be auger-assisted feed of the clean granular material into the vessel 11.

Moreover, instead of a right-circular vessel 11 as illustrated, the vessel 11 could be elongate and of rectangular section in plan, the granular material descending under the influence of gravity towards a rigid divider (not illustrated) which would split the flow of granular material into two roughly equal portions; contaminated gas would then be caused to pass through the filter bed, some through one of said portions and the rest through the other portion. If this approach is adopted, it may well prove to be simpler to remove a higher proportion of dirty granular material, it being a danger (from the point of view of economics) that too much clean granular material will be removed with the dirty granular material.

The principal advantages of the granular system described above are:-

1. It can be made very efficient.
2. It can be manufactured at reasonable cost.
3. It can cope with high temperatures provided that the proper granular material is used.
4. It is reliable (i.e. no filter material to

become torn or to become holed.

5. It may be tailored to suit the particular circumstances of the plant concerned.

6. Crushed or pulverised refractory brick is the preferred material because refractory bricks are available as waste and this means that the necessary heat-resistant free-flowing granular material can be produced relatively cheaply.

CLAIMS:

1. A method of cleaning a gas (as defined above) which has been contaminated, said method including the step of passing a stream of the contaminated gas through a bed of heat-resistant, free-flowing granular material in order to cause a substantial proportion of the or each particulate contaminant to become trapped in said granular material.

2. A method as claimed in Claim 1, wherein the stream of contaminated gas is passed through a bed of refractory material.

3. A method as claimed in Claim 2, wherein said refractory material is a recycled waste material (e.g. waste refractory bricks which have been crushed and graded).

4. A method as claimed in Claim 2, wherein said refractory material is a specially made product (e.g. small ceramic beads).

5. A method as claimed in any one of the preceding Claims, wherein the removal of contaminants which are of gaseous form is achieved by the addition of the necessary chemical(s) and/or chemical compounds to the granular material before said material is formed into said bed.

6. An apparatus operable to enable the carrying into effect of the method claimed in Claim 1, said apparatus

comprising a vessel which has a first aperture for the loading of heat-resistant, free-flowing granular material into the vessel, a second aperture for the discharge of such granular material contaminant, a third aperture for the admission into the vessel of a gas (as defined above) which has been contaminated, a fourth aperture through which cleaned gas may pass out of said vessel, and baffle means within the vessel and such as will ensure that said contaminated gas will pass from the third aperture to the fourth aperture through said granular material.

7. An apparatus as claimed in Claim 6, wherein the discharge of the granular material which contains particulate material takes place under the influence of gravity.

8. An apparatus as claimed in Claim 6 or Claim 7, wherein the baffle means include a vertically arranged tube which, with parts of the outer wall of the vessel, serve to support a column of the granular material through which the contaminated gas will pass.

9. An apparatus as claimed in Claim 6, wherein there is auger-assisted discharge of the dirty granular material.

10. An apparatus as claimed in any one of the preceding Claims 6 to 9, wherein there is auger-assisted feed of the clean granular material into the vessel.

11. An apparatus as claimed in any one of the preceding Claims 6 to 10, wherein the vessel is elongate and of rectangular section in plan, a rigid divider being provided for the purpose of splitting the flow of granular material into two roughly equal portions; the arrangement being such that, in use of the apparatus, contaminated gas would be caused to pass through the filter bed, some through one of said portions and the rest through the other portion.

12. A method of cleaning a gas (as defined above) substantially as hereinbefore described with reference to the accompanying diagrammatic drawing.

13. An apparatus constructed, arranged and adapted to operate substantially as hereinbefore described with reference to and as illustrated in the accompanying diagrammatic drawing.

14. Any features of novelty, taken singly or in combination, of the embodiments of the invention hereinbefore described with reference to the accompanying diagrammatic drawing.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

9127163.5

Relevant Technical fields

(i) UK Cl (Edition K) B1T (TFAA, TFBA, TFBB, TFBX, TFCA, TFDA, TFDX, TFEA, TFXA)

(ii) Int Cl (Edition)

Search Examiner

R T HAINES

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search

2 MARCH 1992

Documents considered relevant following a search in respect of claims 1-13

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2191715 A	Midrex	1, 2, 4, 5, 6, 7, 9
X	GB 2119675 A	Margraf	1, 2, 5, 6, 7, 9, 10, 11
X	GB 0979560 A	Aluminium Laboratories	1, 2, 6, 7, 8, 9, 10
X	US 4622052 A	Margraf	1, 2, 6, 7, 9, 10, 11
X	US 4452613 A	Littrell	1, 2, 6, 7, 9

(2)

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

ISDOCID: <GB 2252059A>

Published 1992 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.